Microbiology case 29

signs and symptoms for the disease: 18 y/o male presented with 48-hour history of painful urination with a yellowish penile discharge

of note: he returned 2 days ago from Daytona Beach where he had been sexually active with several female partners; denied previous such episodes, stated he was generally in good health

source of infectious organism: *Neisseria gonorrhoeae*

manner of exposure, route of infection, tissues that they reside and, where appropriate, transmission to others:

* strictly human pathogen
  + asymptomatic carriers are largest reservoir
* infection spread primarily by sexual contact
  + any sexually active person can be infected
    - in the U.S., highest reported rates of infection are among sexually active teenagers, young adults, and African Americans
* infection initiated by colonizing the mucosal epithelium, which serves as the site of entry

pathology and the manner by which the particular disease develops and/or is induced, including damage caused by the pathogen and damage caused by the immune system’s response to the pathogen:

* *N. gonorrhoeae* binds to columnar epithelial cells mediated by bacterial pili and outer membrane proteins (OMPs)
  + sophisticated genetic mechanisms enable the bacteria to control the presence or absence of these components, a phenomenon called phase variation
  + host antibodies to pili and OMPs do not protect against gonococcal infection
* IgA protease, an extracellular enzyme of the pathogenic *Neisseria*, hydrolyzes IgA mucosal antibodies and inhibits the opsonization needed for phagocytic killing
  + gonococcal OMPs (e.g. protein I) also protect against phagocytosis, and protein I interferes with neutrophil degranulation.
* local invasion through or around epithelial cells allows *N. gonorrhoeae* to reach the subepithelial matrix, where it initiates an intense inflammatory reaction, ushering in PMNs.
* in men, pain, dysuria, and urethral discharge are brought on
* *N. gonorrhoeae* causes a variety of other clinical syndromes which are debilitating, particularly to women (e.g. pelvic inflammatory disease)

methods of identification and placement into a particular biological subset:

* all *Neisseria* species are Gram-negative diplococci
* smear of urethral discharge can be examined under a microscope after Gram staining
  + presence of multiple pairs of bean-shaped, Gram-negative diplococci within a neutrophil in a Gram smear of urethral discharge is diagnostic of gonorrhea (more sensitive in males vs. females)
* do not have a polysaccharide capsule but have pili, cell-wall lipooligosaccharide, and OMPs, all of which contribute to virulence
* fastidious organisms grow on selective media (e.g. Thayer Martin medium)
* oxidase positive
* isolates from clinical specimens confirmed by sugar (glucose) fermentation, immunoassay, or DNA probes

factors leading to enhanced resistance or susceptibility (e.g., recipients of vaccines, residence in geographic areas, types of work, immunodeficiency, alcoholism, age, violence/abuse, religious believes, etc.):

* individuals at increased risk include those with multiple sexual partners; inherited complement deficiencies; early age at onset of sexual activity; and lower socioeconomic status

other organisms in the differential diagnosis and how to discriminate among potential causative agents: *Chlamydia trachomatis*, *Mycoplasma hominis*, *Neisseria gonorrhoeae*, *Ureaplasma urealyticum*

* urethral discharge in men is related to a relatively few organisms. in sexually active individuals, purulent discharge is highly suggestive of gonorrhea. the other agents in the differential diagnosis, particularly *Chlamydia*, generally cause a clear discharge.

prevention, treatment and vaccine design (live vs. dead):

* prevention- surest way to avoid transmission of STDs is to abstain from sexual intercourse (sex can wait, masturbate!), or to be in a long-term mutually monogamous relationship with a partner who has been tested and is known to be uninfected
  + latex condoms, when used consistently and correctly, can reduce the risk of transmission of gonorrhea
  + there is no vaccine
* tx- penicillin-resistant *N. gonorrhoeae* originated in SE Asia and has become widespread in the U.S. and worldwide. successful treatment of gonococcal infection requires the use of third-generation cephalosporins or quinolones.
  + single injection of ceftriaxone is the currently recommended drug of choice
  + pts treated for gonorrhea should simultaneously be treated for chlamydia b/c coinfection rates are high. presumptive treatment of sexual partners is also recommended.